

ABSTRACT OF THE DISCLOSURE

A self-aligned inner gate recess channel in a semiconductor substrate includes a recess trench formed in an active region of the substrate, a gate dielectric layer formed on a bottom portion of the recess trench, recess inner sidewall spacers formed on sidewalls of the recess trench, a gate formed in the recess trench so that an upper portion of the gate protrudes above an upper surface of the substrate, wherein a thickness of the recess inner sidewall spacers causes a center portion of the gate to have a smaller width than the protruding upper portion and a lower portion of the gate, a gate mask formed on the gate layer, gate sidewall spacers formed on the protruding upper portion of gate and the gate mask, and a source/drain region formed in the active region of the substrate adjacent the gate sidewall spacers.